

Application Number 10/541602
Response to the Office Action dated 02/28/2008

REMARKS

Favorable reconsideration of this application is requested in view of the following remarks.

Claim 1 has been amended to include the minimum content of a transition metal oxide (T-oxide) that is a part of limitations of claim 2 and accordingly, claim 2 is amended to delete the limitation included in claim 1; claim 8 has been rewritten in an independent form of original claim 1 and amended as supported by the specification at page 4, lines 33-36, page 8, lines 25-30 and Fig. 3; and claims 22-26 have been added as supported by the specification at page 8, lines 25-30 and Fig. 3 and original claims 10-14. See also the specification at page 9, line 36 – page 10, line 1, page 10, line 1, page 10, lines 6-8, page 10, lines 8-9, and page 10, lines 11-14 for claims 22, 23, 24, 25 and 26, respectively.

Claims 18-21 have been canceled without prejudice.

Claims 8 and 9 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants respectfully traverse this rejection.

Conventionally, glass was made by a melting method and did not include crystals. However, since new glass such as glass-ceramics has been developed, glass including crystals is well recognized among those skilled in the art (see a copy of Abstract of "Nano-crystal glass-ceramics obtained by crystallization of vitrified red mud" provided by CABI attached hereto). Therefore, these claims are definite, and this rejection should be withdrawn. Applicants do not concede the correctness of this rejection.

Claims 1-7 and 10-11 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaguchi et al. (U.S. Patent Application Publication No.

Application Number 10/541602
Response to the Office Action dated 02/28/2008

2001/0021685) in view of Sullivan et al. (U.S. Patent No. 5,753,371). Applicants respectfully traverse this rejection.

Sakaguchi discloses that the minimum visible-light transmission of the glass is 70 % when the glass thickness is 4 mm (see para. 0052). In contrast, claim 1 requires that the maximum visible-light transmission be 85 % when thickness of the glass flake is 15 μm . In general, the light transmission decreases when the thickness of the sample increases according to Beer-Lambert Law (see a copy of Beer-Lambert Law provided by the University of Adelaide, Department of Chemistry attached hereto). According to Beer-Lambert Law, the light absorption (A) is proportional to the path length, i.e., thickness of the glass, and the relationship between the light absorption (A) and light transmission (T) is provided by a formula $A = -\log T$. Therefore, when the thickness of the glass flake is 4 mm as provided by Sakaguchi, i.e., 267 times thicker than the thickness required by claim 1, the light absorption is 267 times larger than the absorption of the glass flake of claim 1. Accordingly, the light transmission of the glass flake of claim 1 with 4 mm thickness would be nearly 0 %¹ and would be far less than 70 % that Sakaguchi requires. In addition, Sakaguchi discloses a minimum limit of total iron oxide content as 0.02 wt % and preferred maximum limits of total Fe_2O_3 content of 1.0 wt % if the glass contains no Se, and 0.6 wt % if the glass contains Se (see para. 0063). In contrast, claim 1 of the present invention requires more than 10 mass % of a transition metal oxide such as Fe_2O_3 in the glass flake. This minimum requirement of claim 1 is 500 times higher than the minimum limit 0.02 wt % of Sakaguchi and 10 times higher than the preferred maximum limit 1.0 wt % if the glass contains no Se, or 16.7 times higher than the preferred maximum limit 0.6 wt % if the glass contains Se. In addition, Sakaguchi discloses a content of other transition metal oxides such as TiO_2 , CoO , and CeO_2 , as max. 1.0 wt %, max. 0.005 wt %, and max. 2.0 wt %, respectively (see paras. 0020- 0022). The total of the preferred content of Fe_2O_3 , TiO_2 , CoO , and CeO_2 is therefore, 4.005 wt % even if no Se is contained and still much lower than 10 mass % that claim 1 requires. Therefore, claim 1 is distinguished from Sakaguchi. In addition, Sullivan discloses or suggests neither that the T-metal oxide content is more than 10 mass

¹ $1/10^{267}$ of the transmission of the glass flake with 15 μm thickness.

Application Number 10/541602
Response to the Office Action dated 02/28/2008

% in the glass flake nor that the maximum visible light transmission is 85 % of the glass flake with the thickness of 15 μm . Therefore, Sullivan does not remedy the deficiencies of Sakaguchi. Accordingly, claim 1 is distinguished from Sakaguchi in view of Sullivan, and the rejection of claims 1-7 and 10-11 should be withdrawn.

Claim 12-13 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaguchi et al. (U.S. Patent Application Publication No. 2001/0021685) in view of Sullivan et al. (U.S. Patent No. 5,753,371) and in further view of Fujita et al. (Japanese Patent Application Publication No. H5-017710). Applicants respectfully traverse this rejection.

Claims 12 and 13 are distinguished from Sakaguchi in view of Sullivan for at least the same reasons as discussed above for claim 1. Fujita discloses or suggests neither that the T-metal oxide content in the glass flake is more than 10 mass % nor that the maximum visible light transmission of the glass flake is 85 % with the thickness of 15 μm . Therefore, Fujita does not remedy the deficiencies of Sakaguchi. Accordingly, claims 1, 12, and 13 are distinguished from Sakaguchi in view of Sullivan and further in view of Fujita, and the rejection should be withdrawn. Applicants do not concede the correctness of the rejection.

Claim 12 and 14 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaguchi et al. (U.S. Patent Application Publication No. 2001/0021685) in view of Sullivan et al. (U.S. Patent No. 5,753,371) and in further view of Marshall et al. (U.S. Patent No. 3,331,699). Applicants respectfully traverse this rejection.

Claims 12 and 13 are distinguished from Sakaguchi in view of Sullivan for at least the same reasons as discussed above for claim 1. Marshall discloses metal oxides that are used for coating on glass flakes (see, for example, coln. 5, lines 51-62; and coln. 6, lines 52-55) but are not included in the glass flakes, and the reference does not disclose or suggest that the T-metal oxide content in the glass flake is more than 10 mass % nor that the maximum visible light transmission is 85 % when the thickness of the glass flake is 15 μm . Therefore, Marshall does not remedy the deficiencies of Sakaguchi.

Application Number 10/541602
Response to the Office Action dated 02/28/2008

Accordingly, claims 1, 12, and 14 are distinguished from Sakaguchi in view of Sullivan and further in view of Marshall, and the rejection should be withdrawn. Applicants do not concede the correctness of the rejection.

In view of the above, Applicants request reconsideration of the application in the form of a Notice of Allowance.



Dated: June 21, 2008

DPM/my/ad

Respectfully submitted,

HAMRE, SCHUMANN, MUELLER &
LARSON, P.C.
P.O. Box 2902
Minneapolis, MN 55402-0902
(612) 455-3800

By: 

Douglas P. Mueller
Reg. No. 30,300

Nano-crystal glass-ceramics obtained by crystallization of vitrified red mud.

Page 1 of 1



English Title: Nano-crystal glass-ceramics obtained by crystallization of vitrified red mud.
 Personal Authors: Pang Fei, Liang KaiMing, Shao Hua, Hu AnMin
 Author Affiliation: Department of Materials Science and Engineering, Tsinghua University, Beijing 100084, China.
 Editors: No editors
 Document Title: Chemosphere, 2005 (Vol. 59) (No. 6) 899-903



Abstract:
 Glass has been obtained by melting red mud from Shandong Province in China with different additives. Suitable thermal treatments were employed to convert the obtained glass into nano-crystal glass-ceramics. X-ray diffraction (XRD) patterns showed that the main crystalline phase in both the glass-ceramics is wollastonite (CaSiO_3). These crystals are homogeneously dispersed within the parent glass, with an average crystal size of less than 100 nm. The size of nano-crystals varies when different thermal processes were used. Physical and mechanical properties, such as density, thermal expansion coefficient, hardness, and bending strength, of the two glasses have been examined and the corresponding microstructures are discussed. These results demonstrate that both glass-ceramics have potential for a wide range of construction application.

Publisher: Elsevier

About CAB Abstracts

CAB Abstracts is a unique and informative resource covering everything from Agriculture to Entomology to Public Health. In April 2008 we published our 5 millionth abstract, making it the largest and most comprehensive abstracts database in its field.

Your search for 'glass-ceramics crystal' has pulled up numerous records and resources from the CAB Abstracts database. At this time, your institution does not subscribe to CAB Direct so you cannot access them. To find out more about this exciting resource, and how to subscribe, please click here.

CAB Abstracts contains a wealth of information on the following items that are related to the abstract above:



About CAB

Established in 1910, CAB is a not for profit organisation, owned by over 40 Member Countries. Through partnership with these countries and our international network of people, we address local needs worldwide. Our activities encompass scientific publishing, research and communication, and our aim is to bridge the gap between scientific knowledge and its application to real life.

We publish CAB Abstracts, a world-leading bibliographic database covering agriculture, environment, public health and nutrition, animal and plant sciences and tourism. We also publish multimedia compendia, books, journals and internet resources - bringing the most up to date scientific information right to researchers' fingertips.

Our People

At the heart of CAB's success are the people who make it happen. We have over 300 staff working from 10 locations around the world, all of them experts in their field. From publishing specialists, microbiologists, ecologists to pathologists, we have the expertise to make a difference.

Find by Google V.V.

Fiberglass
 Search for Glass
 Fabrication Svcs. Find
 Reputable Vendors - Save
 Time
www.globalzpc.com/vendors

Full Text RSS News Feeds
 Articles for web sites
 newswires Complete story
 top stories realtime
www.newsknowledge.com

Online Journals
 Full-text journals for
 academic research at
 Questia Online Library.
www.questia.com/journals

Journal Article
 Find Journal Research
 3000 Sources - Try It Out
 For Free!
www.HighBeam.com

Restoration/Conservation
 Objects, sculpture, miniature
 Ceramics, glass, enamel, etc
www.restoration.net

The education you want. The way you want it.

Business	Criminal Justice	Education
Health Care	Management	Technology

Earn your degree while you work.

[LEARN MORE](#)

KNOWLEDGE FOR LIFE



Department of Chemistry

Stage 2 Chemistry Social Relevance Projects.

[Home](#) | [Contents](#) | [Cross Referenced Index](#) | [Experimental Procedures](#) | [Data Analysis](#)

Beer-Lambert Law

Introduction

The Beer-Lambert law (or Beer's law) is the linear relationship between absorbance and concentration of an absorbing species. The general Beer-Lambert law is usually written as:

$$A = a(\lambda) * b * c$$

where A is the measured absorbance, $a(\lambda)$ is a wavelength-dependent absorptivity coefficient, b is the path length, and c is the analyte concentration. When working in concentration units of molarity, the Beer-Lambert law is written as:

$$A = \epsilon * b * c$$

where ϵ is the wavelength-dependent molar absorptivity coefficient with units of $M^{-1} \text{ cm}^{-1}$.

Instrumentation

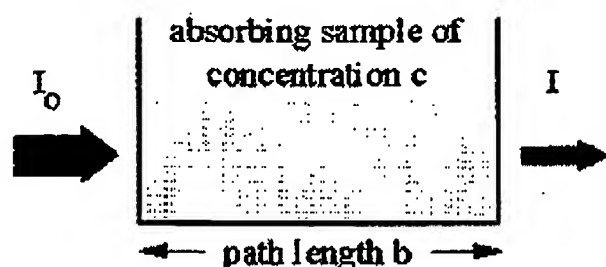
Experimental measurements are usually made in terms of transmittance (T), which is defined as:

$$T = I / I_0$$

where I is the light intensity after it passes through the sample and I_0 is the initial light intensity. The relation between A and T is:

$$A = -\log T = -\log (I / I_0).$$

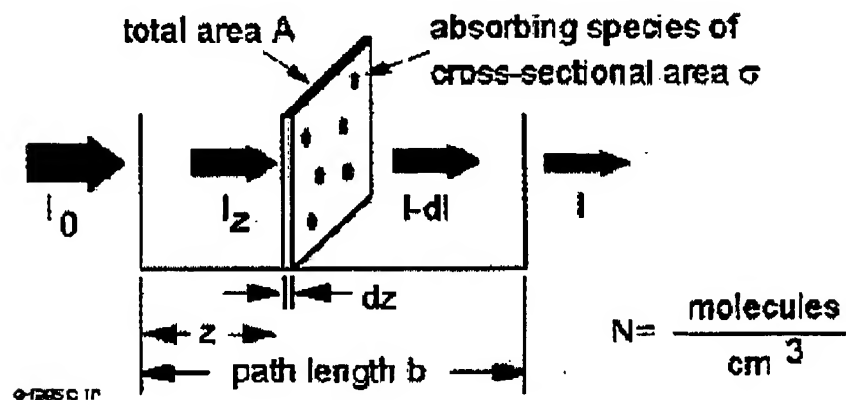
Absorption of light by a sample



Modern absorption instruments can usually display the data as either transmittance, %-transmittance, or absorbance. An unknown concentration of an analyte can be determined by measuring the amount of light that a sample absorbs and applying Beer's law. If the absorptivity coefficient is not known, the unknown concentration can be determined using a working curve of absorbance versus concentration derived from standards.

Derivation of the Beer-Lambert law

The Beer-Lambert law can be derived from an approximation for the absorption coefficient for a molecule by approximating the molecule by an opaque disk whose cross-sectional area, σ , represents the effective area seen by a photon of frequency ω . If the frequency of the light is far from resonance, the area is approximately 0, and if ω is close to resonance the area is a maximum. Taking an infinitesimal slab, dz , of sample:



I_0 is the intensity entering the sample at $z=0$, I_z is the intensity entering the infinitesimal slab at z , dI is the intensity absorbed in the slab, and I is the intensity of light leaving the sample. Then, the total opaque area on the slab due to the absorbers is $\sigma * N * A * dz$. Then, the fraction of photons absorbed will be $\sigma * N * A * dz / A$ so,

Beer-Lambert Law

Page 3 of 4

$$dI / I_z = - \sigma * N * dz$$

Integrating this equation from $z = 0$ to $z = b$ gives:

$$\ln(I) - \ln(I_0) = - \sigma * N * b$$

$$\text{or } -\ln(I / I_0) = \sigma * N * b.$$

Since N (molecules/cm³) * (1 mole / 6.023x10²³ molecules) * 1000 cm³ / liter = c (moles/liter)

$$\text{and } 2.303 * \log(x) = \ln(x)$$

$$\text{then } -\log(I / I_0) = \sigma * (6.023 \times 10^{20} / 2.303) * c * b$$

$$\text{or } -\log(I / I_0) = A = \epsilon * b * c$$

$$\text{where } \epsilon = \sigma * (6.023 \times 10^{20} / 2.303) = \sigma * 2.61 \times 10^{20}$$

Typical cross-sections and molar absorptivities are:

	σ (cm ²)	ϵ (M ⁻¹ cm ⁻¹)
absorption - atoms	10 ⁻¹²	3x10 ⁸
molecules	10 ⁻¹⁶	3x10 ⁴
infrared	10 ⁻¹⁹	3x10
Raman scattering	10 ⁻²⁹	3x10 ⁻⁹

Limitations of the Beer-Lambert law

The linearity of the Beer-Lambert law is limited by chemical and instrumental factors. Causes of nonlinearity include:

- deviations in absorptivity coefficients at high concentrations (>0.01M) due to electrostatic interactions between molecules in close proximity
- scattering of light due to particulates in the sample
- fluorescence or phosphorescence of the sample
- changes in refractive index at high analyte concentration
- shifts in chemical equilibria as a function of concentration
- non-monochromatic radiation, deviations can be minimized by using a relatively flat part of the absorption spectrum such as the maximum of an absorption band
- stray light

Beer-Lambert Law

Page 4 of 4

Related Topics

- [Introduction to spectroscopy](#)

[Home](#) | [Contents](#) | [Cross Referenced Index](#) | [Experimental Procedures](#) | [Data Analysis](#)